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by Ho Lee Young, Paul X. Callahan, and Harold P. Klein

Ames Research Center

Moffett Field, Calif.

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SUMMARY

Cells of Pseudomonas (Hydrogenomonas) saccharophila have been analyzed for their amino acid composition. Seventeen amino acids of the cellular proteins were quantitatively determined. The free amino acid pool accounted for less than 3 percent of the total amino acids of the cells.

INTRODUCTION

In recent years, considerable interest has developed in the hydrogen bacteria as potential sources of food in bioregenerative life support systems (ref. 1). Preliminary studies by Calloway indicated that these organisms, when fed to rats, can satisfy at least part of the nutritive requirement for proteins. Little information is available, however, regarding the amino acid content of this group of organisms.

During studies on the induced synthesis of enzymes by Pseudomonas saccharophila (ref. 2), the amino acids of its cellular proteins and of its free amino acid pool were determined. While this organism is generally cultivated in the presence of organic carbon sources, it was first isolated as a hydrogen bacterium (ref. 3). The organism thus grows autotrophically, with hydrogen as its energy source (refs. 3 and 4), or heterotrophically. As these properties are shared by most members of the genus Hydrogenomonas (ref. 5), it is felt that data on P. saccharophila would be of interest.

MATERIALS AND METHODS

Cells of P. saccharophila were cultivated heterotrophically on a synthetic medium containing 0.2 percent lactate as the only organic component (ref. 6). Conditions for growing, washing, and harvesting the cells are given elsewhere (ref. 7).

For analysis of the amino acid pool, cells were extracted with 1 percent picric acid, after which the picric acid was removed in a Dowex 2 column (ref. 8). The cells were then lyophilized and analyzed. Total amino acids were prepared by hydrolyzing washed cells in 6N HCl for 24 hours. Quantitative amino acid analyses were performed using a Beckman amino acid analyzer.

RESULTS

Table I gives the results of analyses for the amino acids of the pool and of the cellular proteins.

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TABLE I.- AMINO ACID COMPOSITION OF THE POOL AND OF PROTEINS
OF P. SACCHAROPHILA

Amino acid	Percent composition in free amino acid pool ^a	Percent composition in whole hydrolysate	Percent composition in protein
Lysine	9.55	5.73	5.60
Histidine	.56	1.81	1.86
Arginine	3.50	5.01	5.06
Aspartic	2.01	9.72	10.00
Threonine ^b	3.21	5.37	5.45
Serine ^b	5.81	4.64	4.60
Glutamic	13.51	10.52	10.43
Proline	6.33	5.59	5.57
Glycine	8.41	9.65	9.71
Alanine	19.35	13.57	13.39
Half cystine	7.44	.36	.12
Valine	8.93	7.55	7.50
Methionine	.12	2.03	2.10
Isoleucine	2.89	4.14	4.18
Leucine	5.55	8.35	8.45
Tyrosine ^b	.99	2.32	2.37
Phenylalanine	1.84	3.56	3.62

^aμM of free amino acids in the pool comprise 2.77 percent of the total μM of amino acids in P. saccharophila (see, also, ref. 9).

^bUncorrected for decomposition during hydrolysis. Usual values for decomposition during 22 hours of hydrolysis at 110° C are: threonine, 3 percent; serine, 7 percent; tyrosine, 10 percent.

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